Space Weather Technical Forecast

Issued on Wednesday, 06 March 2024 at 01:27 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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The planned NOAA SWPC data outage on 6th March between 1600 UTC and 2200 UTC has been postponed until further notice. This was due to impact most of our observational data feeds and some models.
https://www.swpc.noaa.gov/news/postponement-planned-network-outage.

Space Weather Forecast Headline: Chance of isolated M-Class flare throughout. Slight chance of G1/Minor Storm conditions on 07 and 08 March.
Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low with a peak C2.6 flare at 095/1125UTC, from the vicinity of AR3592 and AR3598, close to the southwest limb. There are seven classified sunspot regions, with AR3595 the largest region. AR3602 demonstrated some spot emergence to the north of the region. A further, as yet unnumbered region is rotating onto the eastern limb. The remaining regions are either weak or fading. No further Earth-directed CMEs have been observed.

Solar Wind / Geomagnetic Activity: Solar wind parameters observed at L1 have averaged around 400-450km/s following a CME arrival on 03 March. Density has been mostly below average. Total magnetic field strength started near moderate levels, around 10nT, but has weakened to around 6nT. The north-south component has varied weakly throughout between +8nT and -7nT. Phi angle has been negative (away from the Sun) throughout, Geomagnetic activity was Quiet to Unsettled (Kp1-3).

Energetic Particles / Solar Radiation: GOES18 high energy (greater than 10MeV) proton flux was at background levels. High energy electron flux (greater than 2MeV) observed at GOES16 was predominantly at background levels with the associated 24 hour fluence well below the Active (1e8 integrated pfu) threshold. The observed 24-hour fluence was level at 06/0000UTC was 1.23e6 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Low with a slight chance of an isolated M-class flare, mainly due to the region in the far western hemisphere.

Solar Wind / Geomagnetic Activity: A CME which left the Sun on 03 March may glance the Earth on 07 March, with low confidence. A coronal hole high speed stream is also forecast to connect with the Earth, either on 07 March, but more likely on 08 March, with solar winds perhaps reaching 500km/s. Geomagnetic activity is expected to be Quiet to Unsettled through 06 March. This may then reach Unsettled to Active levels through 07 and 08 March, with a slight chance of G1/Minor Storms from either the CME or coronal hole high speed stream connection.

Energetic Particles / Solar Radiation: GOES18 high energy proton flux is expected to persist at background levels. GOES16 high energy electron flux is expected to remain at mainly background levels, with the associated 24hr fluence remaining well below the Active threshold.

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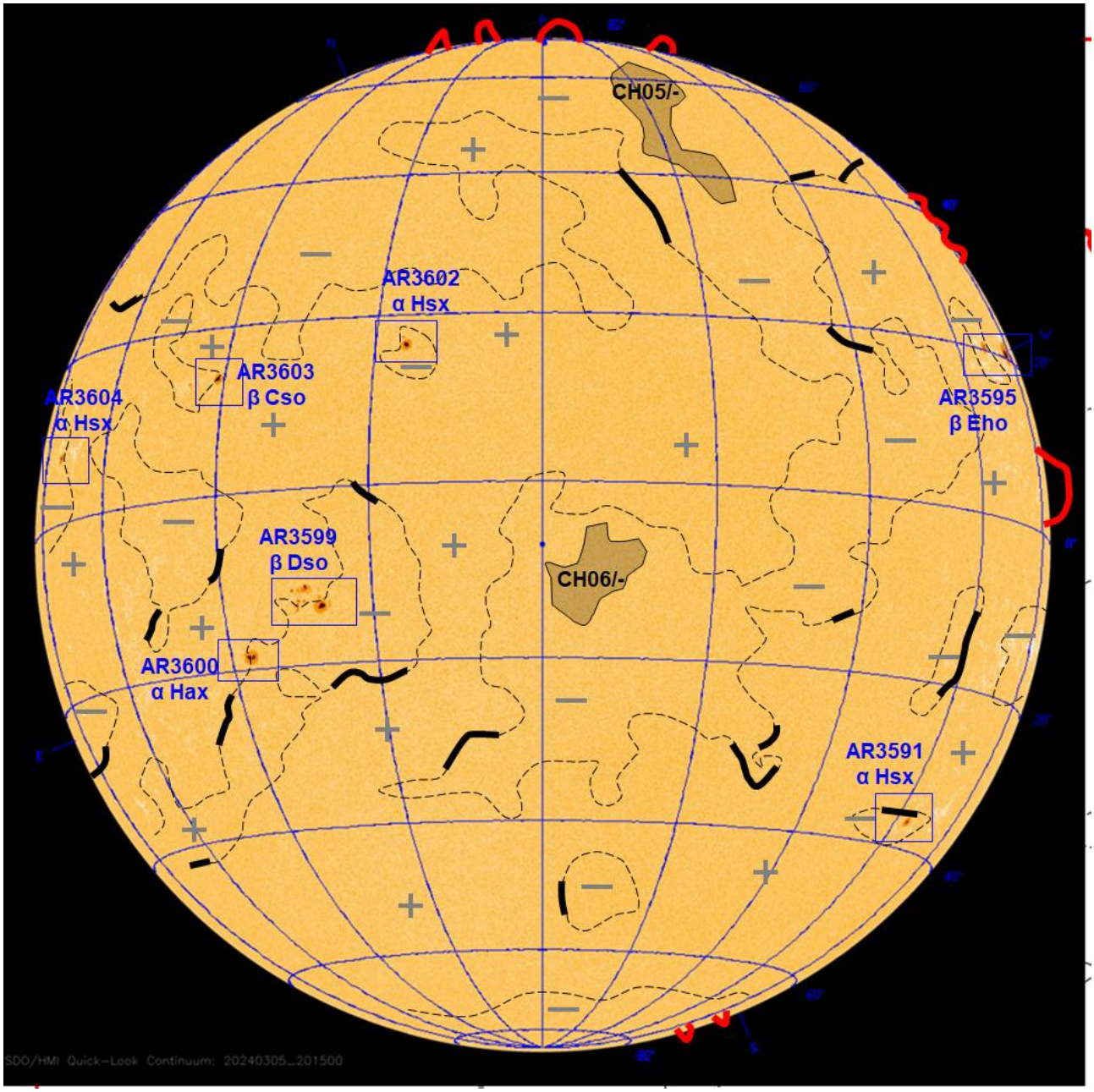
Figure 1. Solar Analysis Valid 2000 UTC, 05 March 2024.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

A CME, originating from AR359, was observed to depart the southwest of the Sun on 03 March may glance the Earth with impacts possible on 07 March, although this is low confidence. No other CMEs are forecast to affect the Earth.
Otherwise the Earth is in a slightly elevated solar wind environment following the arrival of a CME on 03 March. Solar winds are anticipated to erratically decline to slow-ambient during 06 March. The CME from 03 March is then due to arrive on either 07 or 08 March with solar winds perhaps reaching 500km/s, but low confidence in both speed and direction with a glancing blow possible. A negative polarity coronal hole currently near centre disc is forecast to possibly connect with Earth either during 07 or more likely into 08 March with solar winds reaching similar levels if the CME were to impact. This coronal hole is a new feature, so there is some uncertainty as to the levels that solar winds will reach. Geomagnetic activity from this feature could be favoured for a strong connection close to the March equinox.
Quiet to Unsettled geomagnetic activity is forecast to continue during 06 March. Unsettled to Active activity is then possible through 07 and 08 March, with a slight chance of G1/Minor Storm conditions due to the CME, coronal hole high speed stream, or a combination of the two features.

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	1	10	20	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
03/1730	Partial	Filament	Near AR3591 – SW quadrant	500 km/s	07/0600 UTC	Low confidence, glancing blow

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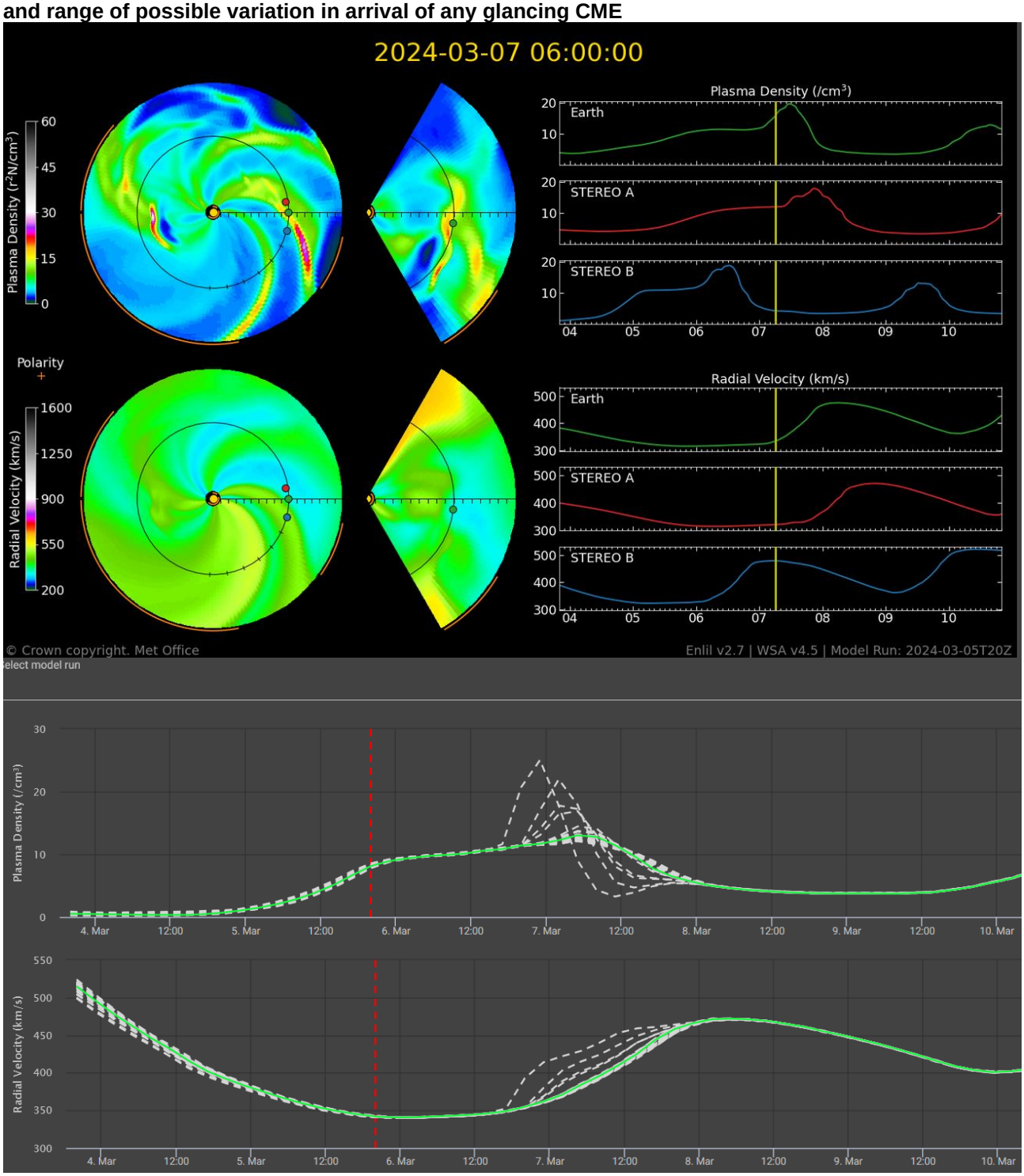
Figure 2: MOSWOC Enlil model and Enlil ensemble, showing deterministic solution for CME arrival and range of possible variation in arrival of any glancing CME



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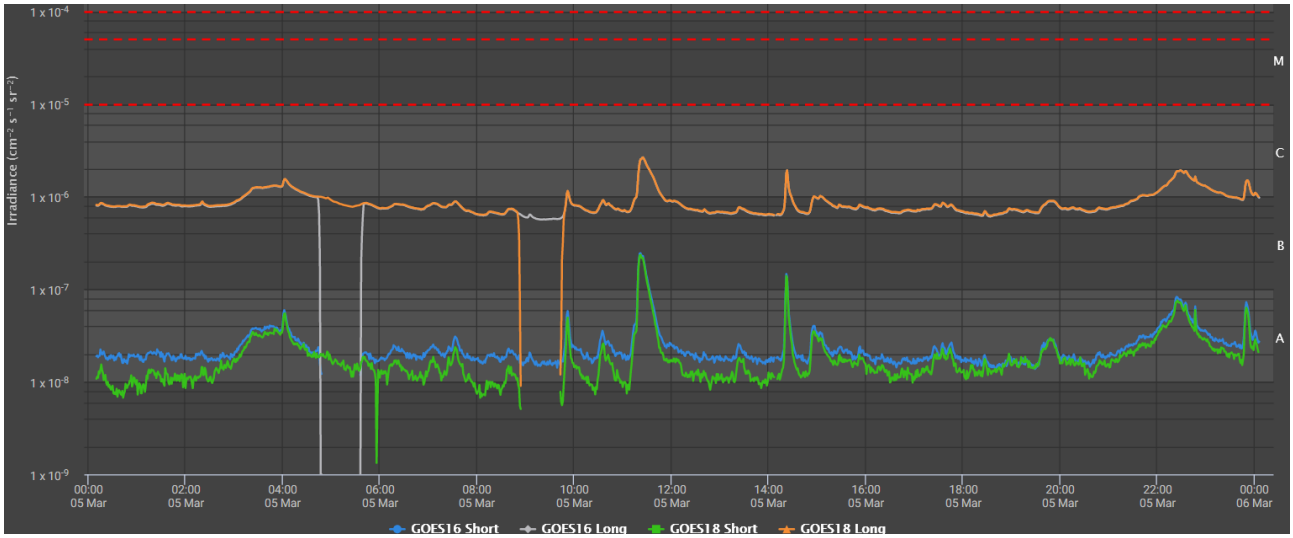
Radio Blackouts - X-Ray Flares:
There are seven active regions on the visible disc, with the majority of these either weak or generally fading. The most notable region on the disc is AR3595, and although still large, this region has decreased in complexity as it approaches the western limb. AR3599 continues to develop in the southeast with some increased complexity of the magnetic field, and this particular active region is currently the second largest feature.

Low activity is expected, with a chance of isolated Moderate activity. There is the likelihood of a complex region rotating onto the eastern limb by 07 March, with this balancing the loss of AR3395 later in the period.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	20	20	30	30
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: GOES 16 X-ray flux with low solar activity continuing with C-class flares in evidence.



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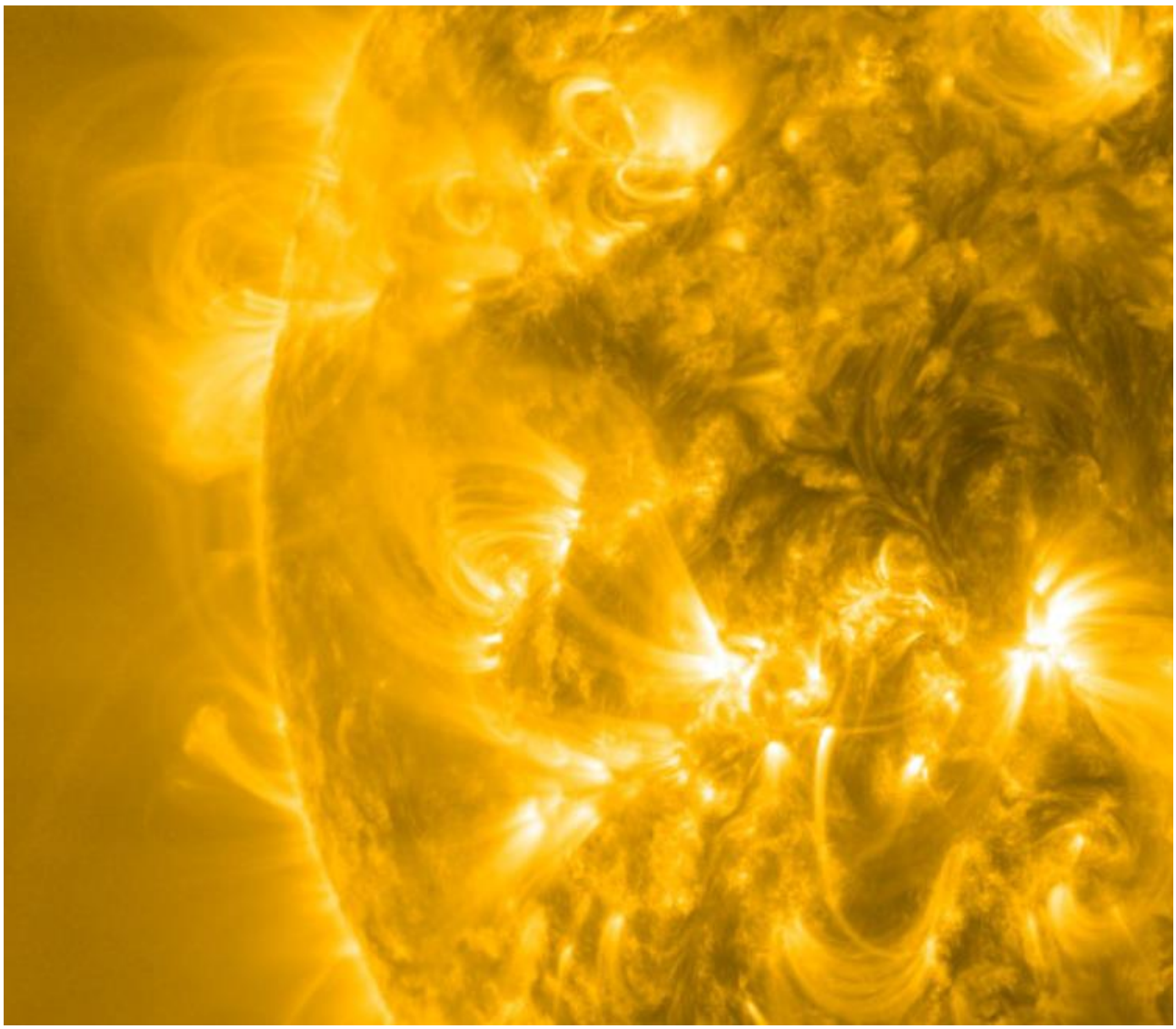
Solar Radiation Storms - (High Energy Protons):
GOES-18 proton flux is currently at background levels, and is expected to remain so through the period.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	5
Very Active	**≥ S3 ***	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

Figure 4: SDO aia-171 imagery at 06/0112UTC showing limited coronal looping on eastern limb.



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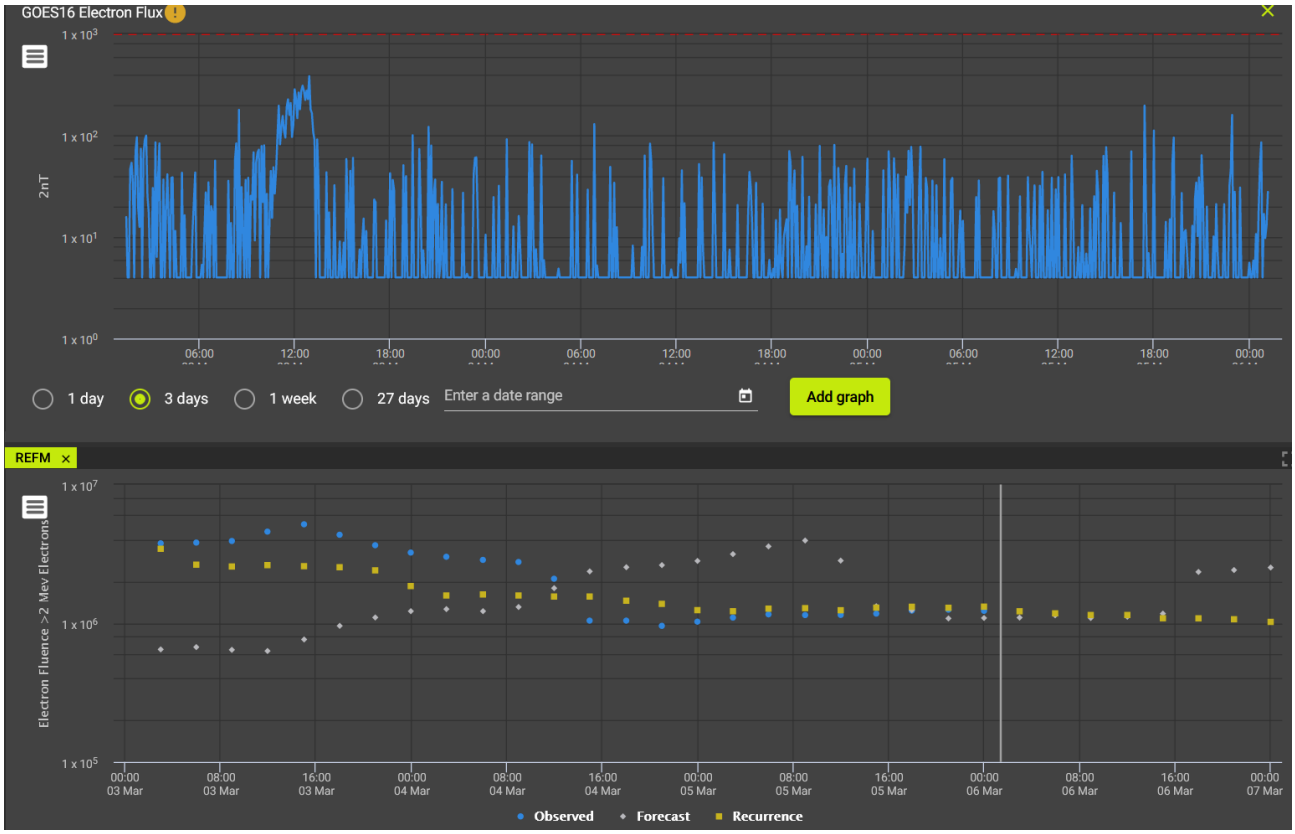
High Energy Electrons Event (≥ 2MeV):
High energy electron flux (greater than 2MeV) is expected to remain at background levels through much of the forecast period, with no significant inputs. The result of any enhancements to solar winds from either the CME or coronal hole high speed stream are more likely to be realised towards the end of this four-day guidance period.
Consequently, the electron fluence is expected to remain well below the Active threshold.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	5
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 5: High energy electron flux at GEO and Met Office REFM output.



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